

Overview

Mitochondrial Disease Working Group: Cognitive/Behavioral/Psychological

The National Institute of Neurological Disorders and Stroke (NINDS) Mitochondrial Disease (Mito) Cognitive/Behavioral/Psychological Common Data Elements (CDEs) Working Group (WG) drafted recommendations based on validated tools for academic achievement, adaptive characteristics, attention, cognition, dementia, emotional/behavioral characteristics, executive functioning, intellectual functioning, language, memory, motor and visual-spatial processing. The WG centered its recommended instruments on tools that are useful based on what is known about the various phenotypes of patients with mitochondrial disorders. An example is the inclusion of tools that assess nonverbal learning for children with motor impairments that affect their speech. In addition, the WG selected tools that would be useful in a natural history study and would help to characterize a population as well as tools that may be better at demonstrating change over time to be used in clinical trials.

There are a broad range of clinical phenotypes affecting both children and adults with mitochondrial disorders. Owing to this fact the instruments recommended will vary based on the type of mitochondrial disorder. Also, the scoring and use of the instruments may vary based on the clinical history. For example, the WG made specific recommendations on how to score assessments in degenerative disorders in children by utilizing raw scores rather than standard scores to track development with greater sensitivity and also provided a method to get around floor effects in individuals with severe cognitive impairment by calculating Z-scores based on published and potentially unpublished means and variability in normative samples.

Given the heterogeneity in presentation and the fact that symptoms may wax and wane over the course of the entire life span, the WG recommends involving a professional Neuropsychologist to help with the selection of the appropriate tools and choosing the best methods to score the assessments. The WG also suggests considering whether the instrument will be used as a natural history descriptor or studying change over time in a clinical trial. The WG acknowledges that one may choose to select individual parts of the larger tools to study in clinical trials. An example of this would be the use of memory or executive functioning subsets of the NIH Toolbox instead of using the whole instrument.

While choosing instruments to recommend the WG did not encounter any issues specific to individuals with mitochondrial disorders. However, the group notes that there are few to no studies that validate any of these instruments in either children or adults specifically for mitochondrial disorders.

Summary Recommendations

Instrument / Scale Name <i>Name and acronym of the instrument/measure that is recommended for inclusion in the CDEs</i>	Domain	Subdomain	Classification (e.g., Core, Supplemental, Exploratory)
Adaptive Behavior Assessment System-II (ABAS-II)	Cognitive	Adaptive	Supplemental
Autism Diagnostic Interview, Revised (ADI-R)	Cognitive	Emotional/Behavioral	Supplemental
American National Adult Reading Test	Cognitive	Academic Achievement, Adaptive	Supplemental
Apathy Evaluation Scale	Cognitive	Emotional/Behavioral	Supplemental- Highly Recommended
Apathy Scale	Cognitive	Emotional/Behavioral	Supplemental
Automated Neuropsychological Assessment Metrics	Cognitive	Cognitive (multiple domains)	Supplemental
Autism Diagnostic Observation Schedule (ADOS)	Cognitive	Emotional/Behavioral	Supplemental
Axon Sports Computerized Cognitive Assessment Tool	Cognitive	Cognitive	Supplemental
Beck Anxiety Inventory	Cognitive	Emotional/Behavioral	Supplemental

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Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI)	Cognitive	Motor Function	Supplemental
Behavior Rating Inventory of Executive Function (BRIEF)	Cognitive	Executive Functioning	Supplemental- Highly Recommended
Behavior Rating Inventory of Executive Function- Preschool Version (BRIEF-P)	Cognitive	Executive Functioning	Supplemental- Highly Recommended
Benton Judgment of Line Orientation (JLO)	Cognitive	Visual-Spatial Processing	Supplemental
Boston Aphasia	Cognitive	Language, Dementia	Supplemental
Boston Naming Test (BNT)	Cognitive	Language, Dementia	Supplemental
Brief Infant Toddler Social Emotional Assessment	Cognitive	Emotional/Behavioral	Supplemental
Brief Psychiatric Rating Scale	Cognitive	Emotional/Behavioral	Supplemental
Brief Test of Adult Cognition by Telephone	Cognitive	Cognitive	Supplemental
Cambridge Behavioral Inventory-Revised	Cognitive	Emotional/Behavioral	Supplemental

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Cambridge Cognitive Assessment-Revised	Cognitive	Cognitive	Supplemental
Center for Epidemiologic Studies-Depression Scale	Psychological	Emotional/Behavioral	Supplemental
Child and Adolescent Scale of Environment	Cognitive	Other	Supplemental
Child and Adolescent Scale of Participation	Cognitive	Other	Supplemental
Child Behavior Checklist	Cognitive	Emotional/Behavioral	Supplemental
Child Depression Inventory	Psychological	Emotional/Behavioral	Supplemental
Clinical Evaluation of Language Fundamentals (CELF-4)	Cognitive	Language	Supplemental
Columbia Suicide Severity Rating Scale	Psychological	Emotional/Behavioral	Supplemental
Comprehensive Assessment of Spoken Language (CASL)	Cognitive	Language/Pragmatic Language	Supplemental
Conners 3	Cognitive	Attention	Supplemental- Highly Recommended
Delis–Kaplan Executive Function System (D-KEFS)	Cognitive	Attention, Emotional/Behavioral, Executive Functioning	Supplemental

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Diagnostic and Statistical Manual of Mental Disorders	Psychological	Emotional/Behavioral	Supplemental
Expressive Vocabulary Test-2 (EVT-2)	Cognitive	Language	Supplemental
Generalized Anxiety Disorder (GAD-7) Severity	Psychological	Emotional/Behavioral	Supplemental
Global Memory and Summary Scale (See as referenced in A.C. Turconi et al)	Cognitive	Memory	Supplemental
Hamilton Anxiety Rating Scale	Psychological	Emotional/Behavioral	Supplemental
Hamilton Depression Rating Scale	Psychological	Emotional/Behavioral	Supplemental
Informant Questionnaire for Cognitive Decline in the Elderly	Cognitive	Dementia	Supplemental
Irritability Scale	Cognitive	Emotional/Behavioral	Supplemental
Kauffman Assessment Battery for Children (K-ABC)	Cognitive	Intellectual Ability	Supplemental
Leiter International Performance Scale-3	Cognitive	Nonverbal Intellectual Ability	Supplemental

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(Leiter-3)			
Memory Assessment Scale (see AC Turconi et al)	Cognitive	Memory	Supplemental
Modified Overt Aggression Scale	Cognitive	Emotional/Behavioral	Supplemental
Montgomery-Åsberg Depression Rating Scale	Psychological	Emotional/Behavioral	Supplemental
Montreal Cognitive Assessment	Cognitive	Dementia	Supplemental
Mood Disorder Questionnaire	Psychological	Emotional/Behavioral	Supplemental
NeuroQOL	Cognitive	Health-related Quality of Life	Supplemental
Neuropsychological Assessment II (NEPSY II)	Cognitive	Attention, Executive Functioning, Language, Memory (selected subtests), Visual-Spatial Processing	Supplemental
NIH Toolbox	Cognitive	Attention, Intellectual Ability, Motor Function	Supplemental
NIH Toolbox Cognitive Battery	Cognitive	Cognitive (multiple domains)	Supplemental

Instrument / Scale Name <i>Name and acronym of the instrument/measure that is recommended for inclusion in the CDEs</i>	Domain	Subdomain	Classification (e.g., Core, Supplemental, Exploratory)
NIH Toolbox Emotional Battery	Cognitive	Emotional/Behavioral	Supplemental
Patient Reported Outcomes Measurement Information System (PROMIS)	Cognitive	Emotional/Behavioral	Supplemental
Physical and Neurological Examination for Soft Signs (PANESS)	Cognitive	Motor	Exploratory
Peabody Picture Vocabulary Test-4 (PPVT-4)	Cognitive	Language	Supplemental
Preschool Language Scales-Fifth Edition (PLS-5)	Cognitive	Language	Supplemental
Problem Behaviors Assessment for HD - short version	Cognitive	Emotional/Behavioral	Supplemental
Reynell Developmental Language Scale	Cognitive	Language	Supplemental
Reynolds Intellectual Assessment Scale (RIAS)	Cognitive	Intellectual Ability	Supplemental
Social Responsiveness Scale	Cognitive	Emotional/Behavioral	Supplemental

Instrument / Scale Name <i>Name and acronym of the instrument/measure that is recommended for inclusion in the CDEs</i>	Domain	Subdomain	Classification (e.g., Core, Supplemental, Exploratory)
Test of Variable of Attention (TOVA)	Cognitive	Attention	Supplemental- Highly Recommended
Vineland Adaptive Behavior Scales, 2nd Ed	Cognitive	Adaptive	Supplemental- Highly Recommended
Weschler Adult Intelligence Scale Fourth Edition (WAIS-IV)	Cognitive	Attention (Cancellation subtest- for visual attention), Intellectual Ability	Supplemental
Weschler Intelligence Scale for Children-IV (WISC-IV)	Cognitive	Attention (Cancellation subtest- for visual attention), Intellectual Ability	Supplemental
Wechsler Memory Scale-IV	Cognitive	Memory	Supplemental
Weschler Preschool and Primary Scale of Intelligence-III (WPPSI-III)	Cognitive	Attention (Cancellation subtest- for visual attention), Intellectual Ability	Supplemental
Weschler Preschool and Primary Scale of Intelligence-IV (WPPSI-IV)	Cognitive	Intellectual Ability	Supplemental